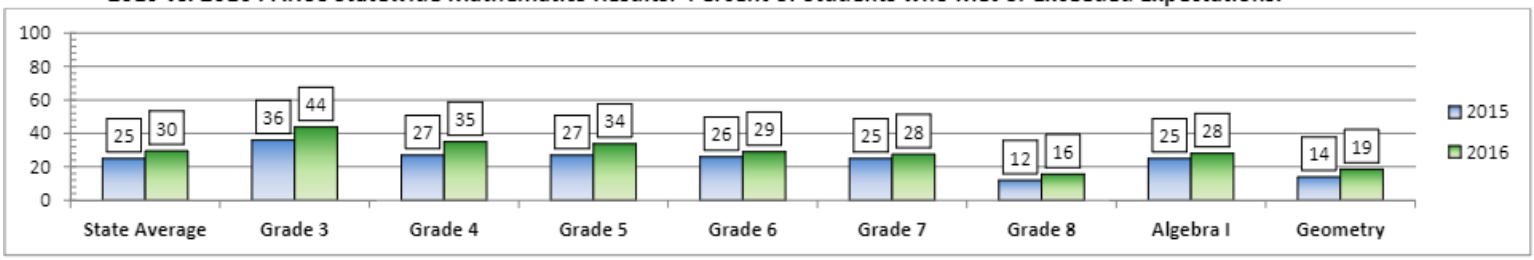
Analysis of PARCC Algebra 1 - January 2017
Mathematics

This document highlights the overall results for PARCC Mathematics as well as a brief analysis of the Student Evidence Statements for the PARCC Assessment.

The results of the 2016 PARCC assessment reveal that a percentage of Rhode Island students who Met or Exceeded Expectations in Mathematics increased compared to 2015. With the exception of Grade 8, the percent of students scoring at these combined levels ranged from 20% to 45%. Grade 8 offers a peculiar case in that 25% of students at this grade level were administered the Algebra 1 assessment, and as such, are not represented in the Grade 8 statistics.

2015 vs. 2016 PARCC Statewide Mathematics Results: Percent of Students who Met or Exceeded Expectations.



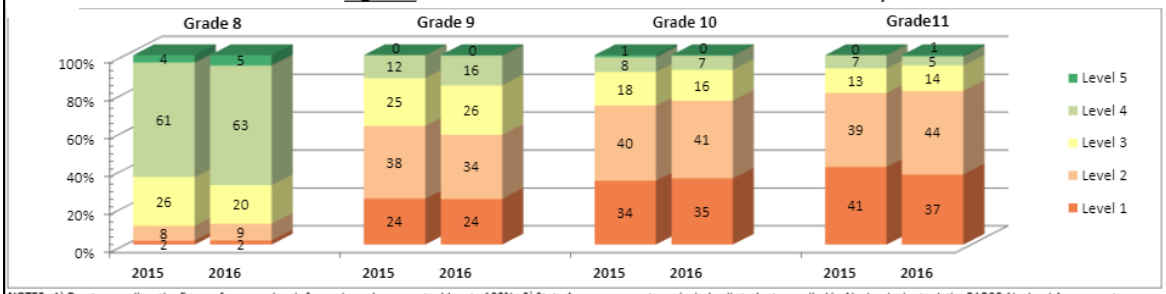
NOTE 1: Grade 8 percentages only include students who took the Grade 8 Math Assessment and State Average percentages only include Level 4 and Level 5 averages for all grade-specific math assessments combined.
NOTE 2: This graph includes all students (irrespective of grade) who were enrolled in Algebra I and/or Geometry and took either (or both) assessments.

The graph below illustrates the state average for the percent of students meeting or exceeding PARCC expectations for all grades 8 - 11 in Algebra 1, for 2015 and 2016. Overall, the number of students that are demonstrating proficiency is increasing. In particular, the proficiency rate for Algebra 1 all together increased from 25.5% in 2015 to 28.1% in 2016. It should be noted that this data has its limitations and can only provide an overall picture of how the grade level/course is doing with content.

2015 vs 2016 PARCC Statewide Mathematics Results:

Percent of students at each level of Algebra 1 by Grades 8– 11 for 2015 and 2016

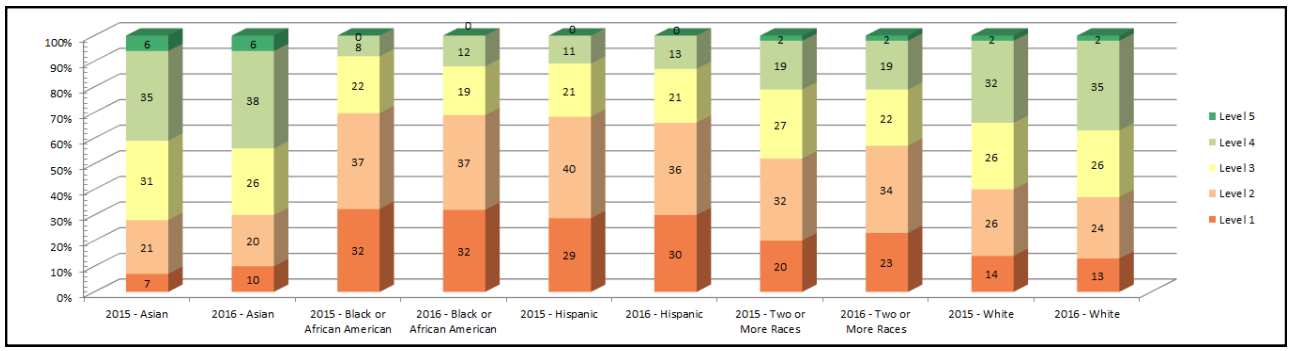
2015 vs. 2016 PARCC Statewide Algebra I Results: Percent of Students in Each Performance Level by Grade.



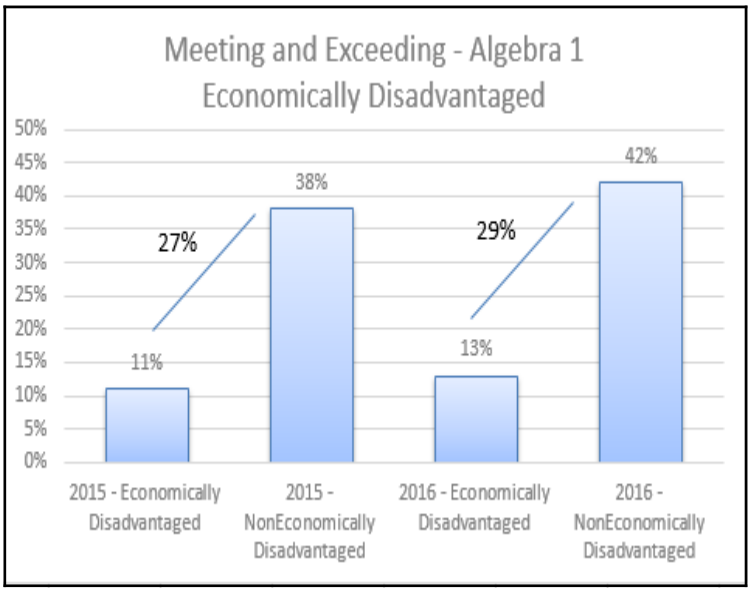
NOTES: 1) Due to rounding, the five performance levels for each grade may not add up to 100%. 2) State Average percentages include all students enrolled in Algebra I who took the PARCC Algebra I Assessment.

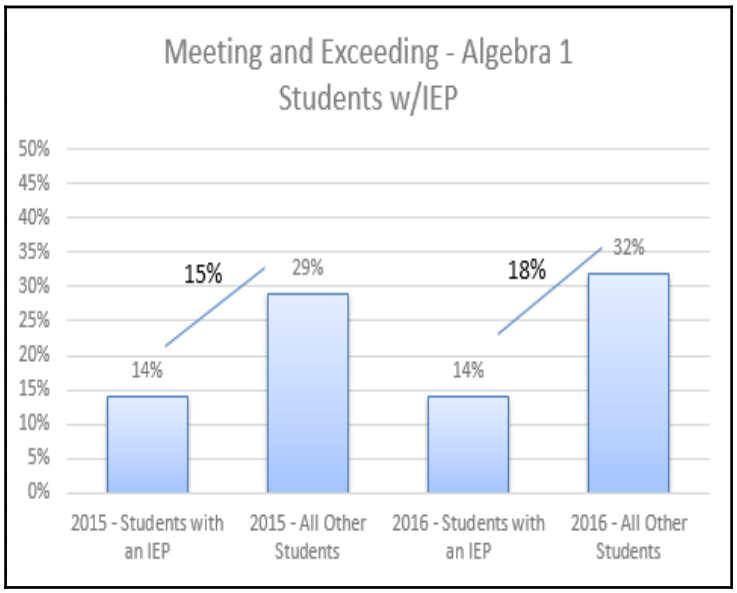
Separating the data into different student demographic groups, as shown below, presents opportunities for analysis leading to differentiating instruction. By looking at the results for the past two years and the gaps between groups, educators can determine which student groups may be in need of additional support during core instruction.

Algebra 1 Results by Race, 2015 and 2016



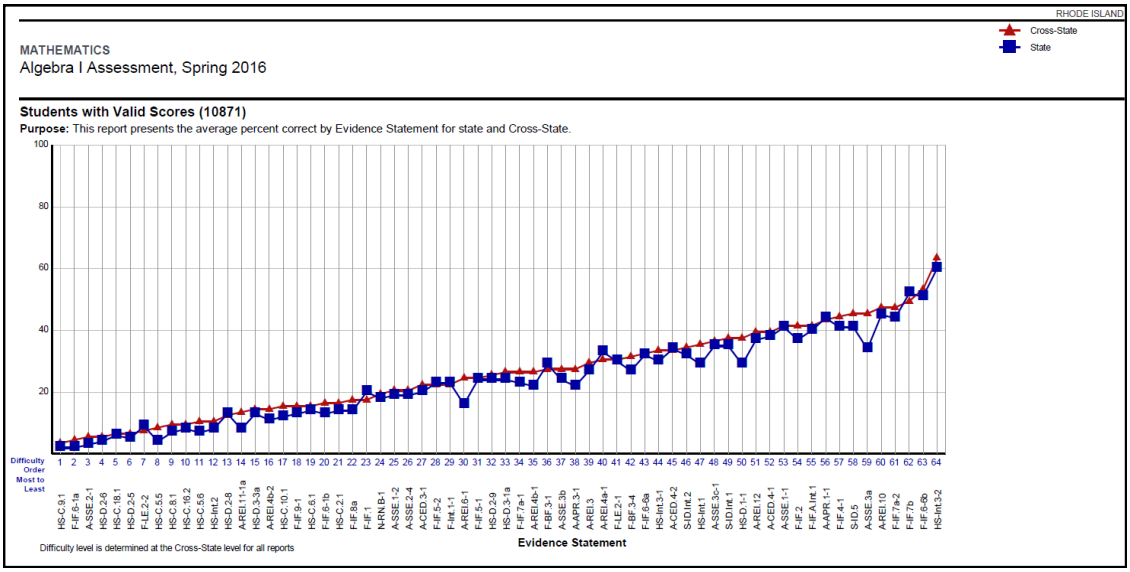
The next two graphs provide additional opportunities to understand the performance of various subgroups of students. The first illustrates the gaps in proficiency between economically disadvantaged and non-economically disadvantaged students for 2015 and 2016. The second graph displays data comparing gaps in proficiency for students with an IEP and students without an IEP for the same years.





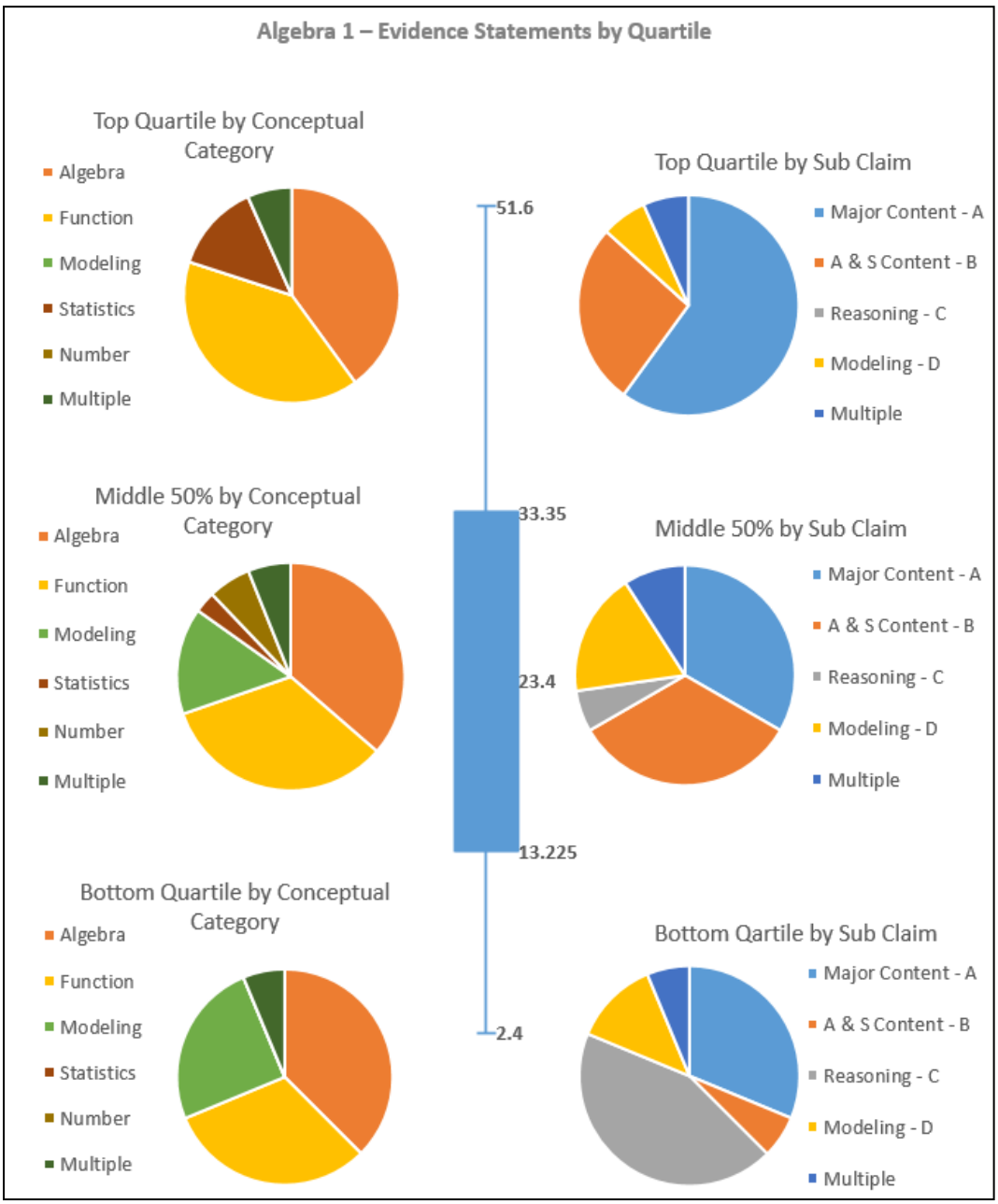
All of this data is useful when viewing the big picture for mathematics performance in Rhode Island. What it does not provide are indications of how students are performing in specific areas of mathematics. This type of information can be obtained from the Evidence Statement Analysis Reports.

RI Evidence Statements - Algebra 1 Compared to Consortium



The above graph displays each evidence statement represented on the PARCC Algebra 1 assessment. The evidence statements are ordered by difficulty level from left (most difficult) to right (least difficult) based on the average percent correct for items keyed to that evidence statement. It provides information on Domains, Clusters, Problem Types, and Sub-Claim areas. Districts and schools can access their reports, as well as a Content Standards Roster Report through Pearson Access Next. The PARCC Model Content Frameworks and the Evidence Statement Tables are available from parcconline.org and are useful resources when analyzing this information.

By analyzing this data for **Algebra 1** throughout the state, we can find results that give indications of areas of instructional need. The graph below is a summary of Student Evidence Statements broken into quartiles[1], by highest performance to lowest performance, and categorized in two ways, Sub-Claim[2] and Conceptual Category[3].



Serval observations can be made by determining the specific evidence statements that fall within each quartile.

Study of the top quartile by:

Conceptual Category

- Most of the Statistics and Probability evidence statements are present in this quartile.
- The conceptual category of modeling is not present in this quartile.

Sub-Claim

- No reasoning or modeling evidence statements are present in this quartile.

Study of the bottom quartile by:

Conceptual Category

- Number and Quantity and Statistics and Probability evidence statements are not present in this quartile.

Sub-Claim

- More than half of the quartile is comprised of reasoning and modeling evidence statements.

Summing up Algebra 1 , when viewing the data by quartile, it becomes apparent that most students are struggling in the following areas:

- Sub-Claim C (Expressing Mathematical Reasoning with Connections to Major Content highlighting Standards for Mathematical Practice 3 and 6)
- Sub-Claim D (Modeling/Application with Connections to Major Content highlighting Standards for Mathematical Practice 4).

Tips on how to use this document

This document is provided so Rhode Island districts can make comparisons between the state data for performance on the Student Evidence Statements and their local data. The hope is districts will use this document as a starting point for conversations about their local data. These conversations may then inform changes in curriculum, assessment, sequencing, and instructional practice.

When engaging in these conversations, groups of educators should consider reviewing the:

- gap numbers over time for race, students with disabilities and economically disadvantaged;
- evidence statement keys to determine the mathematics in the top and bottom 25% of their local data;
- Sub-Claims represented in the top and bottom 25% of their local data; and
- results across the grades of the top and bottom 25% of their local data noting the changes in Student Evidenced Statements through the grades.

Research States, with lower levels of performance in the areas of expressing mathematical reasoning, constructing arguments, critiquing the reasoning of others, and the application of learned mathematics in problem-solving situations involving the creation of mathematical models, it is often the case that students have limited exposure to complex mathematical tasks which provide an opportunity to develop these proficiencies. When students are required to interact with rigorous tasks, are encouraged to communicate their thinking both to their teachers and peers using correct mathematical vocabulary and evidence of justification, and do so in a collaborative and supporting environment, they will gain the experience they need to become more proficient.

> *One of the reasons we taught mathematics through discussions was because we valued both mathematical reasoning and sense making. We encouraged students to reason about and justify their choice of methods, as we knew this to be an important part of mathematical work that requires discussion. By emphasizing collaboration, students also became accountable for their mathematical ideas and methods in partnership with others. (Bolar, Journal of Mathematical Behavior 41 (2016) 172–178, page 5)*

Resources that provide guidance and examples of rich tasks that promote mathematical reasoning, application and modeling, and communicating mathematically in a collaborative environment can be found at:

- Illustrative Mathematics
- Achieve the Core Tasks
- Inside Mathematics Tasks
- Howard County Algebra 1
- youcubed - a resource for collaborative learning in Mathematics
- Unbound

[1] - Quartile : By Ordering Student Evidence Statements from lowest average score to highest average score and then dividing the average score into four parts, we can see what student evidence statements are in the lower and upper groups, or quartiles, as well as the corresponding Sub-Claims and Domains that match those student evidence statements. In order to make the data user friendly, the graph only shows the bottom 25%, the top 25% and the middle 50% (the middle quartiles are combined).

[2] - Sub-Claim Structure:

The PARCC assessment provides a variety of questions in order to determine what mathematical skills a student has. All Student Evidence Statements are connected to one Sub-Claim and/or Domain depending on the type of item (some integrated items will be connected to multiple Domains). This allows for an analysis of the Student Evidence statements to see which ones are in the bottom and top quartiles.

Sub-Claim Structure for Grades 3-8 and High School:

- Sub-Claim A (Major Content)
- Sub-Claim B (Additional and Supporting Content)
- Sub-Claim C (Expressing Mathematical Reasoning)
- Sub-Claim D (Modeling and Application)

[3] –Conceptual Category (page 57):

Conceptual categories portray a coherent view of high school mathematics; a student's work with functions, for example, crosses a number of traditional course boundaries, potentially up through and including calculus.

The high school standards are listed in conceptual categories:

- Number and Quantity
- Algebra
- Functions
- Modeling
- Geometry
- Statistics and Probability